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EXAMINER

LEUNG, JENNIFER A

ART UNIT PAPER NUMBER

1764

DATE MAILED: 04/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/837,503

Applicant(s)

CALLAGHAN ET AL.

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2004 and 31 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 12-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-17 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Appeal Brief/Arguments

1. Applicant's appeal brief submitted on October 14, 2004 and applicant's supplemental appeal brief submitted on January 31, 2005 have been received and carefully considered.
2. Applicant's arguments with respect to the rejection(s) of claim(s) 1-5, 7-11 and 17 have been fully considered and are persuasive. Therefore, said rejections and the finality of the last office action has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the newly found prior art references, cited below.
3. Claims 12-16 are withdrawn from further consideration. Claims 1-11 and 17 are currently under examination.

Allowable Subject Matter

4. The indicated allowability of claim 6 is withdrawn in view of the newly discovered reference(s), cited in the rejection below.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In lines 18-19, "the second conduit means" lacks proper positive antecedent basis, because a "second conduit means" has merely been optionally recited in lines 11-12, by "at least one of the first and second conduit means".

Claim Rejections - 35 USC § 102 and 35 USC § 103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-3 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Hirota (JP 59-213940).

Regarding claim 1, Hirota (FIG. 3, 4; English Abstract) discloses a fuel cell system comprising: a fuel processor (i.e., a reforming section **1d**) producing a reformed gas; first conduit means (i.e., reforming gas piping **20** to fuel cell piping **20b**) communicating the reformed gas to a shift converter (i.e., CO converter **24**) located downstream of the fuel processor **1d**; second conduit means (i.e., reformed gas piping **25**) communicating the reformed gas to a fuel cell **7**,

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downstream of the shift converter **24**; a water source (i.e., water in tank **15**); and water feed means (i.e., piping, with water pump **16**) for feeding water from the water source **15** to the first conduit means **20/20b** (i.e., at mixer **23**) in a controlled manner.

Regarding claim 2, the system of Hirota structurally meets the claim because the amount of water added and the particular oxygen/carbon ratio fed to the shift converter **24** are considered process limitations that add no further structure to the apparatus claim.

Regarding claim 3, the water feed means includes control means (i.e., a water pump **16**, inherently controllable) for controlling the feeding of water to the first conduit means **20/20b** (i.e., at mixer **23**).

Regarding claim 5, the apparatus (FIG. 3, 4) further includes means for collecting water from the fuel cell **7** and recycling at least a portion of the collected water to the water source **15** (i.e., via piping, with element **14**).

Instant claims 1-3 and 5 structurally read on the apparatus of Hirota.

7. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirota (JP 59-213940) in view of Fanciullo (US 4,046,956).

Hirota (FIG. 3, 4; English Abstract) discloses a fuel cell system comprising: a fuel processor (i.e., a reforming section **1d**) producing a reformed gas; first conduit means (i.e., reforming gas piping **20** to fuel cell piping **20b**) communicating the reformed gas to a shift converter (i.e., CO converter **24**) located downstream of the fuel processor **1d**; second conduit means (i.e., reformed gas piping **25**) communicating the reformed gas to a fuel cell **7**, downstream of the shift converter **24**; a water source (i.e., water in tank **15**); and water feed means (i.e., piping, with water pump **16**) for feeding water from the water source **15** to the first

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conduit means **20/20b** (i.e., at mixer **23**) in a controlled manner. The recitation of an amount of water added and the particular oxygen/carbon ratio fed to the shift converter **24** are considered process limitations that add no further structure to the apparatus claim.

Hirota is silent as to the apparatus further comprising at least one selective oxidizer, between the shift converter **24** and the fuel cell **7**, and located downstream of where the water feed means feeds water to at least one of the first and second conduit means.

Fanciullo (FIG. 1) teaches a fuel cell system comprising a fuel processor (i.e., reformer **17**), a shift converter **28** and a fuel cell **10**. Fanciullo further teaches at least one selective oxidizer **32**, provided between the shift converter **28** and the fuel cell **10**. In the "Description of the Prior Art", Fanciullo evidences that the above stated elements as well as their particular arrangement is conventional to fuel cell systems (see column 1, lines 10-35).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to further provide at least one selective oxidizer at the recited location between the shift converter **24** and the fuel cell **7** in the apparatus of Hirota, on the basis of suitability for the intended use thereof, because the provision of a selective oxidizer further decreases the carbon monoxide content of a reformed gas stream to a tolerable level for use by a fuel cell. The reduction in carbon monoxide minimizes the poisoning of a fuel cell, which is desirable in cases where long life is an important criterion, as taught by Fanciullo (see column 1, lines 27-35).

8. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirota (JP 59-213940) in view of Fleischli et al. (US 5,380,088).

Hirota discloses that the water feed means comprises a mixer device **23** located in the conduit means **20/20b**. Hirota, however, it silent as the mixer device **23** comprising means to

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atomize water, or a packing of high surface area material, wherein the material is selected from the group consisting of ceramic pellets, steel wool, reticulated ceramic foam, metal foam, and honeycomb monoliths.

Fleischli et al. (FIG. 1) teaches a mixing device comprising means to atomize water (i.e., an injection system 3), and a packing of high surface area material (i.e., static mixing unit 4), wherein the material is selected from the group consisting of ceramic pellets, steel wool, reticulated ceramic foam, metal foam, and honeycomb monoliths (e.g., a honeycomb monolith, defined by corrugated layers 11; see FIG. 2).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute the mixer device of Fleischli et al. for the mixer device 23 in the apparatus of Hirota, on the basis of suitability for the intended use thereof, because the mixer of Fleischli et al. is a simple device that provides intimate mixing over the entire cross section of a channel, and over short sections, while maintaining a small pressure drop (see column 2, lines 38-46). In any event, the substitution of known equivalent structures (e.g., the substitution of one known mixing device for another known mixing device) involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958).

9. Claims 1-3 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Takeu (JP 62-283567).

Regarding claim 1, Takeu (FIG. 1; English Abstract) discloses a fuel cell system comprising: a fuel processor (i.e., reformer 8) for producing a reformed gas; first conduit means (i.e., the piping, not labeled, extending between elements 8 and 9) for communicating the

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reformed gas to a shift converter (i.e., a high temperature shift converter 9) located downstream of the fuel processor 8; second conduit means (i.e., the piping, not labeled, extending between elements 9 and 10) for communicating the reformed gas to a fuel cell 1 downstream of the shift converter 9; a water source (i.e., steam source 7); and water feed means (i.e., piping 11 and 12) for feeding water from the water source 7 to at least one of the first and second conduit means in a controlled manner.

Regarding claim 2, the system of Takeu structurally meets the claim because the amount of water added and the particular oxygen/carbon ratio fed to the shift converter 9 are considered process limitations that add no further structure to the apparatus claim.

Regarding claim 3, the water feed means includes control means (i.e., control valves 13 and 14, in conjunction with valves 15 and 16) for controlling the feeding of water 7 to at least one of the first and second conduit means, via pipes 11 and 12.

Regarding claim 11, water 7 is fed to both the first conduit and the second conduit via pipes 11 and 12, respectively (see FIG. 1).

Instant claims 1-3 and 11 structurally read on the apparatus of Takeu.

10. Claims 4 and 7 are rejected under 35 U.S.C. 102(b) as anticipated by Takeu (JP 62-283567), or, in the alternative, under 35 U.S.C. 103(a) as obvious over Takeu (JP 62-283567) in view of Applicant's Disclosed Prior Art.

Regarding claim 4, according to the English abstract, "a temperature transmitter detects the temperature rise to show the generation of a methane reaction, a control valve 13, and automatic breaker valves 15 and 16 are opened... to introduce steam." Although such control elements are not specifically shown in the Figure, the abstract suggests that the system of Takeu

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meets the claim of a "control means [that] senses the temperature of the reformed gas and gas stream, respectively, and feeds water to at least one of the first and second conduits, respectively, in response to the sensed temperature." Furthermore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the claimed control elements in the apparatus of Takeu, on the basis of suitability for the intended use thereof, because, "Such control systems for sensing temperature of a gas stream and controlling a flow valve in response to the sensed temperature are well known in the art," as specifically stated in Applicant's disclosure (see specification, page 5, lines 21-31; specifically, lines 29-31).

Regarding claim 7, although Takeu does not specifically state that the control valves **13** and **14** are "solenoid valves", it would have been obvious for one of ordinary skill in the art at the time the invention was made to select solenoid valves for the control valves **13** and **14** in the apparatus of Takeu, on the basis of suitability for the intended use thereof, because the Examiner takes Official Notice that the use of solenoid valves for control valves is well known in the art.

11. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeu (JP 62-283567) in view of Hirota (JP 59-213940).

Takeu is silent as to the apparatus further comprising means for collecting water from the fuel cell **1** and recycling at least a portion of the collected water to the water source **7**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide means for collecting and recycling water from the fuel cell **1** to the water source **7** in the apparatus of Takeu, on the basis of suitability for the intended use thereof, because the Examiner takes Official Notice that it is well known in the art to collect and recycle unused reactants and products for subsequent use within the apparatus, for raw material

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conservation. This conventionally known concept is further evidenced by Hirota, who teaches a system comprising means for collecting and recycling water produced by a fuel cell 7 to a water source 15, for subsequent use (see FIG. 3, 4).

12. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeu (JP 62-283567) in view of Fanciullo (US 4,046,956).

Takeu (FIG. 1; English Abstract) discloses a fuel cell system comprising a fuel processor (i.e., reformer 8) producing a reformed gas; first conduit means (i.e., the piping, not labeled, extending between elements 8 and 9) communicating the reformed gas to a shift converter (i.e., a high temperature shift converter 9) located downstream of the fuel processor 8; second conduit means (i.e., the piping, not labeled, extending between elements 9 and 10) communicating the reformed gas to a fuel cell 1 downstream of the shift converter 9; a water source (i.e., steam source 7); and water feed means (i.e., piping 11 and 12) for feeding water from the water source 7 to the first and second conduit means in a controlled manner. The recitation of an amount of water added and the particular oxygen/carbon ratio fed to the shift converter 9 are considered process limitations that add no further structure to the apparatus claim.

Takeu is silent as to the apparatus further comprising at least one selective oxidizer, between the shift converter 9 and the fuel cell 1, and located downstream of where the water feed means (e.g., piping 12) feeds water 7 to the second conduit means.

Fanciullo (FIG. 1) teaches a fuel cell system comprising a fuel processor (i.e., reformer 17), a shift converter 28 and a fuel cell 10. Fanciullo further teaches at least one selective oxidizer 32, provided between the shift converter 28 and the fuel cell 10. In the "Description of the Prior Art", Fanciullo evidences that the above stated elements as well as their particular

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arrangement is conventional to fuel cell systems (see column 1, lines 10-35).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to further provide at least one selective oxidizer at the recited location between the shift converter 9 and the fuel cell 1 in the apparatus of Takeu, on the basis of suitability for the intended use thereof, because the provision of a selective oxidizer further decreases the carbon monoxide content of a reformed gas stream to a tolerable level for use by a fuel cell. The reduction in carbon monoxide minimizes the poisoning of a fuel cell, which is desirable in cases where long life is an important criterion, as taught by Fanciullo (see column 1, lines 27-35).

13. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeu (JP 62-283567) in view of Fleischli et al. (US 5,380,088).

Takeu is silent as to the water feed means comprising a mixer device with means to atomize water, or a packing of high surface area material, wherein the material is selected from the group consisting of ceramic pellets, steel wool, reticulated ceramic foam, metal foam, and honeycomb monoliths.

Fleischli et al. (FIG. 1) teaches a mixing device comprising means to atomize water (i.e., an injection system 3), and a packing of high surface area material (i.e., static mixing unit 4), wherein the material is selected from the group consisting of ceramic pellets, steel wool, reticulated ceramic foam, metal foam, and honeycomb monoliths (e.g., a honeycomb monolith, defined by corrugated layers 11; see FIG. 2).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the mixer device of Fleischli in the apparatus of Takeu, on the basis of suitability for the intended use thereof, because the mixer of Fleischli et al. is a simple device

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that provides intimate mixing over the entire cross section of a channel, and over short sections, while maintaining a small pressure drop (see column 2, lines 38-46).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
April 5, 2006 


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